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SEPTEMBER 5 - 8, 1950

MEETING TO BE HELD JOINTLY WITH THE
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FIELD TRIP GUIDE BOOK

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ALBERTA SOCIETY OF PETROLEUM GEOLOGISTS

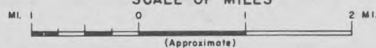
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MOSAIC OF
BANFF AREA

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SCALE OF MILES



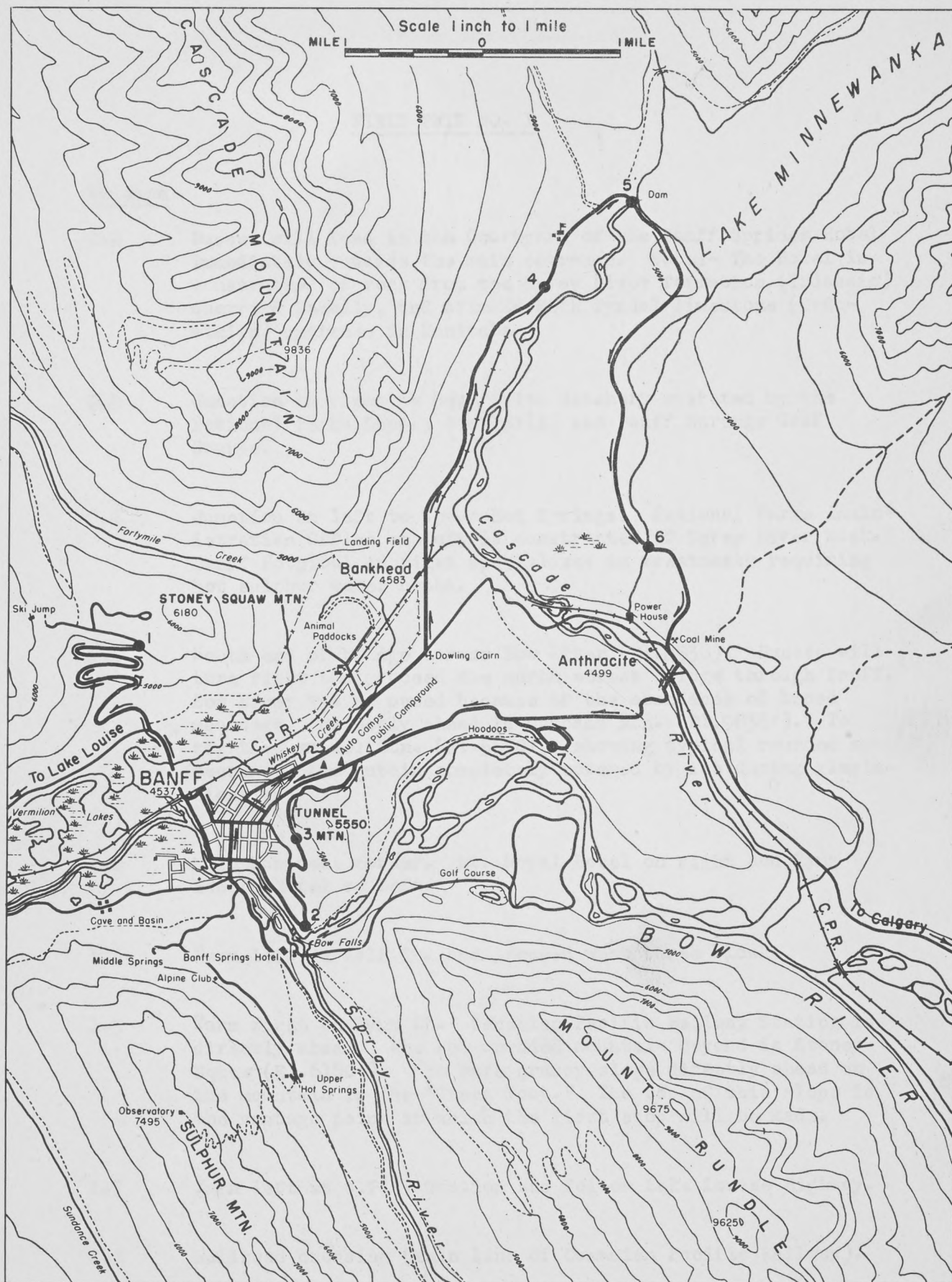


FIG. 1

Route Map of Field Trip No. 1

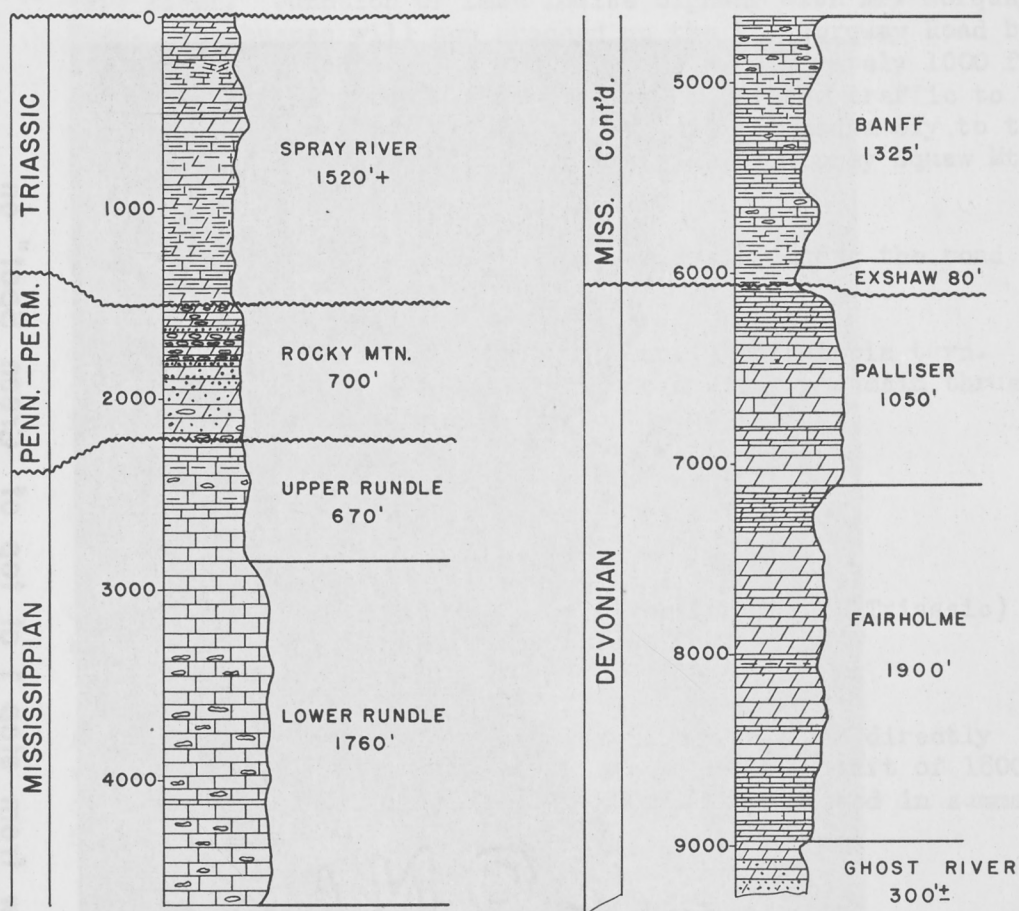
FIELD TRIP NO. 1

Mileage

- 0.0 Busses will load in the Courtyard of the Banff Springs Hotel immediately outside the main entrance. Note:- The Hotel is constructed of rock from the Spray River formation (Triassic) quarried locally, and trimmed with Tyndal limestone (Ordovician) quarried in Manitoba.
- 0.3 Junction on right to Banff Fish Hatchery operated by the National Parks Dept., Bow Falls, and Banff Springs Golf Course.
- 0.7 Junction on left to Upper Hot Springs. National Parks Administration Office on left is constructed of Spray River Rock. Banff Hospital on right specializes in treatments requiring hot sulphur water baths.
- 0.8 South end of bridge across Bow River (El. 4538). Busses will turn right and proceed due north across bridge through Banff. Bow River was so named because of the abundance of broad meanders. Directly ahead is Cascade Mtn. (El. 9836'). To right is Tunnel Mtn. (El. 5550'), showing typical rounded appearance of mountain completely covered by ice during glaciation.
- 1.2 Main business corner. Mt. Royal Hotel on right and King Edward Hotel on left.
- 1.3 Turn left on Wolf St. and proceed west three blocks.
- 1.5 Turn right on Lynx St. Canadian Pacific Railway Station is directly ahead. The low rounded mountain beyond is Stoney Squaw (El. 6180'). The bare grassy slope directly ahead on the mountain is the "Green Spot." The top of this slope is the vantage point at which the first stop will be made.
- 1.7 Turn left at C.P.R. Station and follow Lake Louise Highway.
- 1.8 Railroad crossing (Main line of Canadian Pacific Railway).

STRATIGRAPHIC COLUMN

BANFF AREA



LEGEND

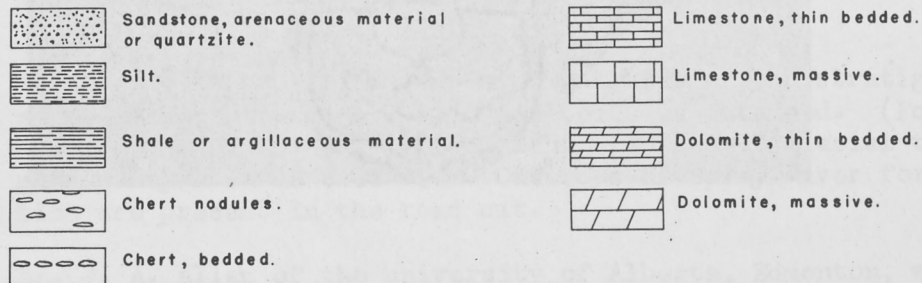


FIG. 2

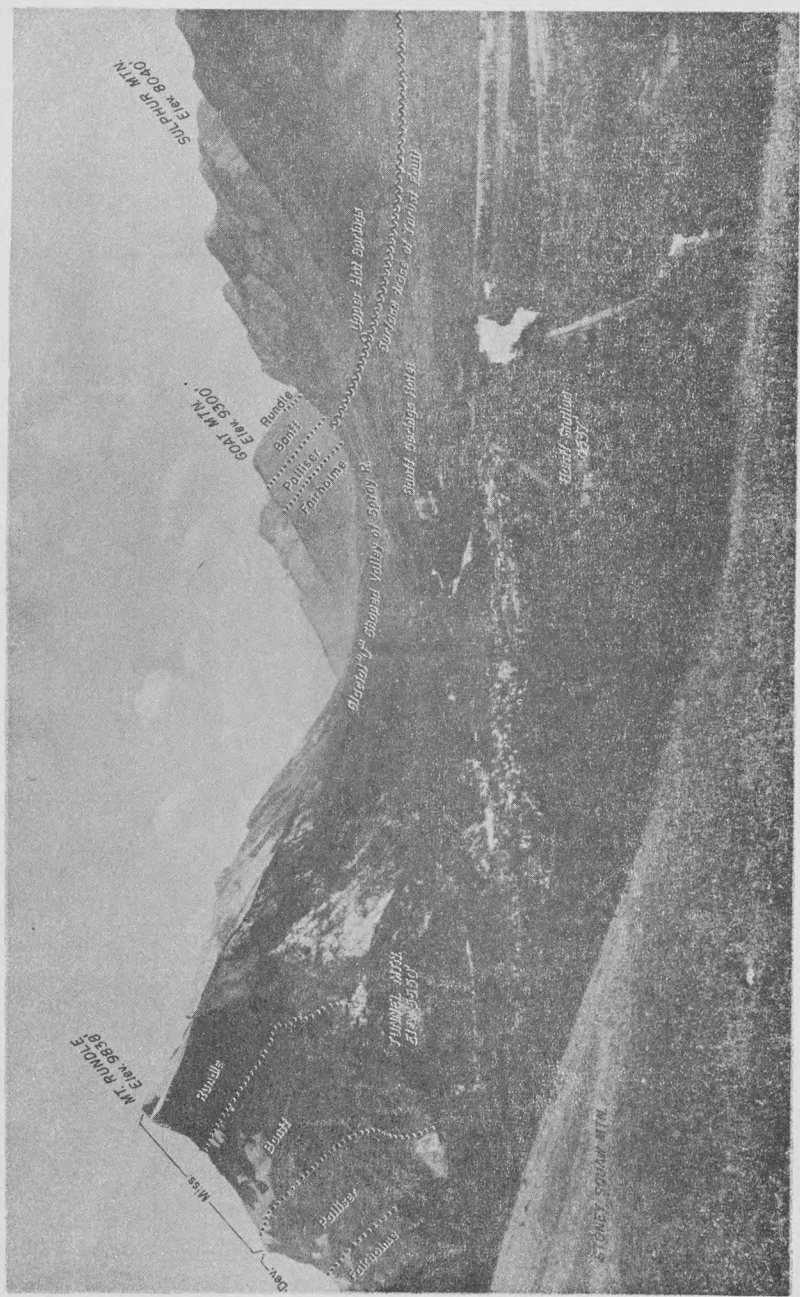


PLATE I - View from stop 1 at top of "Green Spot" on
Stoney Squaw Mountain.

- 2.1 Bridge over Forty-Mile Creek.
- 2.3 Turn right. Junction of Lake Louise Highway with Mr. Norquay Road. The busses will now proceed up the Mt. Norquay Road by a series of switchbacks to an elevation approximately 1000 ft. above the valley floor. This road was built for traffic to the ski slopes on Mt. Norquay, the mountain immediately to the left. The road itself climbs up the side of Stoney Squaw Mtn.
- 2.7 Outcrops of Spray River formation (Triassic) along the road cut.
- 3.2 Outcrops of Rocky Mtn. formation (Penn.?) on hairpin turn. This exposure results from a small drag fold along the main thrust fault which occurs in the gully to the west.
- 3.4 Outcrops of Spray River formation (Triassic).
- 4.3 Outcrops of sharply folded Spray River formation (Triassic) along the Sulphur Mtn.-Norquay thrust fault.
- 4.9 A view of the chair-lift and ski-runs can be seen directly ahead and above. The chair-lift has a vertical lift of 1800' over a distance of approximately 4000'. It is used in summer for sightseeing.
- 5.9 STOP #1

Half hour stop for discussion and pictures. The busses have now reached the top of the "Green Spot." Passengers will unload and the busses will proceed up to the parking ground and turn around. Passengers are asked to note the number of the bus in which they are travelling.

From this Vantage Point and excellent view of the stratigraphic sequence and structure of the mountains is obtained. (Formations named on Plate 1). Excellent examples of glacial topography may also be observed. Outcrops of Spray River formation are present in the road cut.

Dr. J. A. Allan of the university of Alberta, Edmonton, will give a short talk on the geology of the area as seen from this stop.

Busses will now retrace the route to the railroad crossing and will continue straight ahead along the Bow River drive to the Public Parking Lot. They will then turn left (east) on Buffalo St. to Banff Avenue. The second part of the field trip will continue from this point.

0.0 Busses will proceed across Banff Avenue and east on Buffalo Street to Tunnel Mtn. Drive. The Bow River is on the right of the Drive.

0.8 STOP #2

Twenty minute stop for discussion and pictures. The road is cut through the upper part of the type section of the Rocky Mtn. formation (Penn.). The contact of these beds with the overlying Spray River formation is exposed at the base of the cliff in the river bottom. A phosphate bed carrying bone fragments and flourite occurs on the small ledge on the right (west) side of the road.

Chert nodules are well developed on the left (east) side of the road. Chert beds and cross-bedded silty beds are present in the road cut 100 yds. further on at the hairpin turn.

An excellent view of the Banff Springs Hotel, the convention headquarters, is obtained at this stop.

A short discussion of the geological features will be given by Dr. J. A. Allan of the University of Alberta.

The busses will now proceed along the Tunnel Mtn. Drive. The type section of the Rundle formation (Mississippian) is exposed on the south face of Tunnel Mtn. but is not accessible by automobile.

1.3 Buildings on left are Banff School of Fine Arts. Summer school instruction in all forms of art, drama, sketching, etc., is given here under the supervision of the University of Alberta.

1.4 Junction - Make sharp turn to right and continue up the Tunnel Mtn. Drive.

1.8 Exposures of Rundle (Mississippian) limestone along road showing smooth surface resulting from glaciation.

1.9 STOP #3

Ten minute stop. Excellent view of Town of Banff and old glacial lake bottom. Mtns. immediately west are the Massive Range composed essentially of Mississippian and Devonian Rocks. Sulphur Mtn. is the heavily wooded mountain to the west-southwest which has been almost completely glaciated. Note the rounded contours. Mt. Norquay and Stoney Squaw Mtn. with the "Green Spot," the first stop on the field trip, are on the north side (right) of the Bow Valley.

From this point looking up the valley of the Bow River the line of view is across the strike of the Ranges. The observer is located on the west dip slope of the Rundle-Cascade Mtn. fault block and looking through the gap in the next two blocks, the Sulphur-Norquay fault block and the Bourgeau-Sawback fault block. The Massive Range which interrupts the view up the valley is developed on an anticlinal fold which is separated from the Bourgeau-Sawback range by a syncline.

2.5 Outcrops of Rundle (Mississippian) exposed along road cuts.

2.9 Junction - Turn left. Public Camp Grounds and Bungalow Camps.

3.1 A few remnants of glacial morainal deposits occur along the valley walls at this point. Much of this material is re-worked by water.

3.8 Crossroads:- Turn right and continue three blocks on Moose St. to junction with Banff Avenue.

4.0 Crossroads - Stop Sign:- Turn right (north) on Banff Avenue.

5.2 Highway is located along edge of old glacial lake bottom. Exposures of glacial gravels in part re-worked along the right-hand side of the road.

- 5.3 Junction:- Continue straight ahead. Road to left is to Buffalo Paddocks. Here the National Parks Dept. has a few buffalo, elk, moose, etc., in large fenced pastures for a tourist attraction.
- 5.9 Junction - Turn left (north) on Minnewanka Road. The monument at the junction on the right-hand side of the highway is in memory of Dr. D. B. Dowling, a geologist with the Geological Survey of Canada, who was responsible for the major part of the work carried out on the coal resources of the Cascade Coal Basin, which we will be crossing between this point and Lake Minnewanka.
- 6.5 Railroad crossing - main line of the C.P.R. The gravel road to the right just south of the railroad crossing leads to the town incinerator, which is a favorite spot for seeing numerous wild black and brown bears. The mountain directly ahead is Cascade Mtn. (El. 9836'), part of the same fault block as Rundle Mtn. and Tunnel Mtn. The massive lower cliff is formed by the Palliser formation (Devonian).
- 7.8 Road has crossed the surface trace of the Rundle-Cascade thrust fault. The approximate position of this fault can be seen at the base of the massive cliff. Here massive limestones of the Palliser formation (Devonian) are thrust over sandstone, shales and coal seams of Lower Cretaceous age.
- 8.7 Cenotaph on left side of road was erected after the War of 1914-1918. Road now passes through the old business street of the abandoned mining town of Bankhead. Slack heaps present in the valley to the right.
- 9.1 STOP #4
- Twenty minute stop. A short stop will be made at the top of the hill in the abandoned town of Bankhead for a brief discussion on the Cascade Coal Basin with special reference to the coal seams exposed on Cascade Mtn., position of thrust fault, excellent example of cirque valley, and exposures of Cretaceous, Jurassic and Triassic beds in the river valley below. The comments will be given by D. B. Layer.
- 9.2 Exposures of Jurassic marine shales visible along the river valley to the right.

10.1 Exposures of Spray River formation (Triassic) in road cuts.

10.5 STOP #5

Parking Lot at Lake Minnewanka. A ten-minute stop will be made at this point mainly for those wishing to take pictures.

An excellent exposure of the Triassic-Pennsylvanian(?) contact is present in the spillway at the north end of the dam.

The type section of the Minnewanka group (Devonian) was measured on the mountain down the lake valley to the east. Lake Minnewanka is an Indian name, meaning Devil Lake; so named because of the sudden storms which were so disastrous to Indian canoes. Although the dam has raised the level of the lake, it is still an excellent example of a glacial valley, now occupied by a large body of water as a result of drainage channel blocking. The original outlet was at the east end but was changed by glaciation and before the dam was built drained out at the west end through the Cascade River which is now only a dry river channel.

The busses will now proceed across the dam and start recrossing the Cascade Coal Basin by another route.

11.6 Outcrops of Rocky Mtn. formation (Penn.) quartzites and siliceous beds along the road.

11.8 Exposures of Spray River formation (Triassic marine siltstones and shales along the road cuts.

13.4 Diversion canal for electric power on left-hand side of road. the massive mountain ahead is Rundle. Cascade Mtn. is now to the right and Mt. Inglismaldie to the left and slightly behind. The beds forming these mountains are largely Mississippian and Devonian limestones and shales.

14.2 STOP #6

Fifteen minute stop. A short stop will be made at the lower end of the diversion canal. Exposures of Lower Cretaceous, brackish water sands are present in the flume. This stop is an excellent place to see the extent of the Cascade Coal Basin, bounded by the Rundle-Cascade fault to the west and the dip slope of the fault block to the east.

Field Trip No. 2 will traverse this basin and cross the succeeding fault blocks between the basin and the foothills belt to the east of the mountains. A few brief comments will be made by D. B. Layer, Division Geologist for Imperial Oil Company.

- 15.1 Johnson's Lake - Beaver dams and houses visible near the outlet.
- 15.4 Junction with Calgary-Banff Highway. Turn left. Slack heaps on left from the old Anthracite Coal Mine. This mine is now abandoned. Note the coal mined here was a high grade bituminous coal.

The busses will return to Banff via the "Hoodoos." A short stop will be made at this scenic spot if time is available. This will complete Field Trip #1.

STRATIGRAPHIC COLUMN

CASCADE COAL BASIN AND FRONT RANGES

ALONG CALGARY-BANFF HIGHWAY

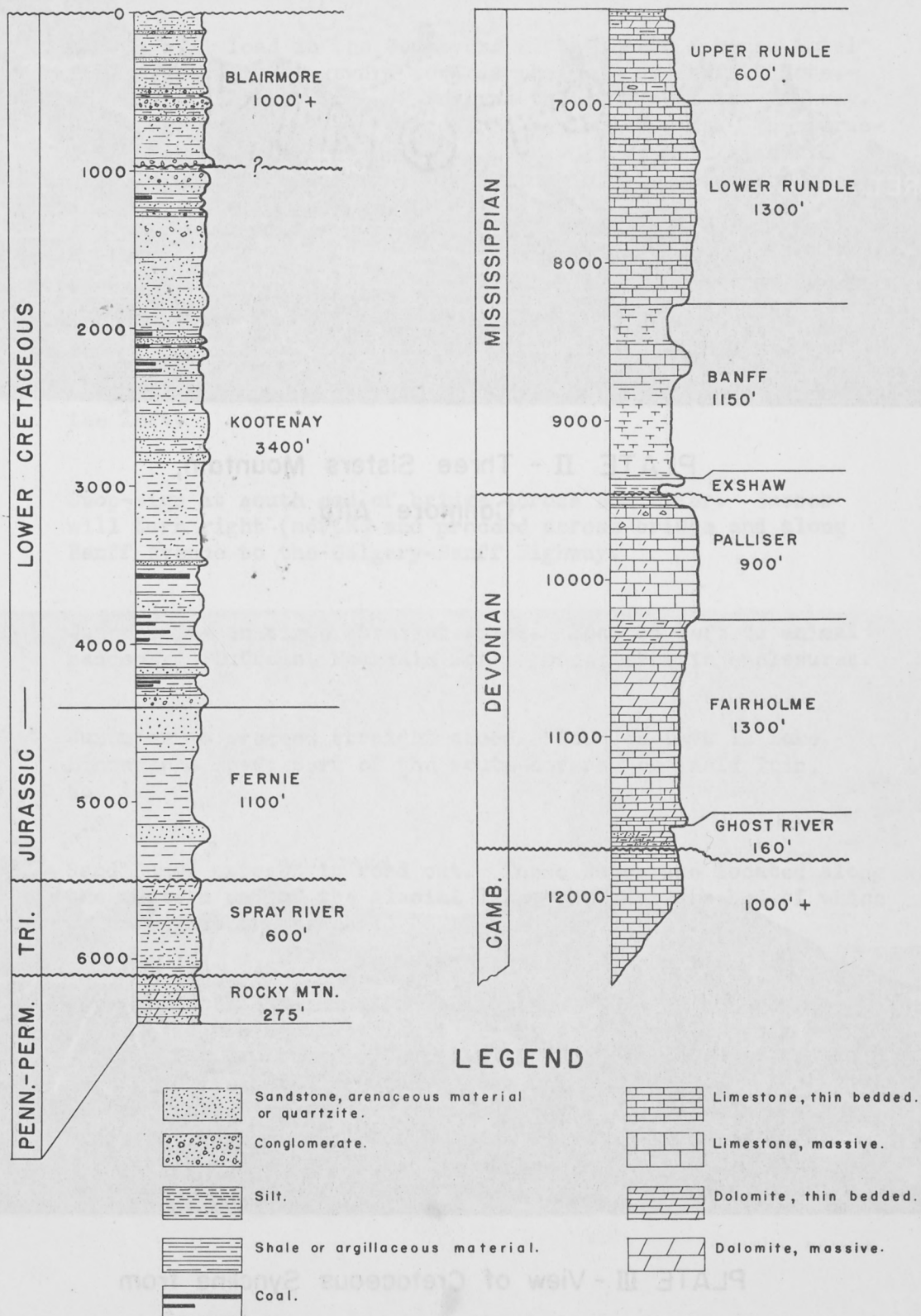


FIG. 3

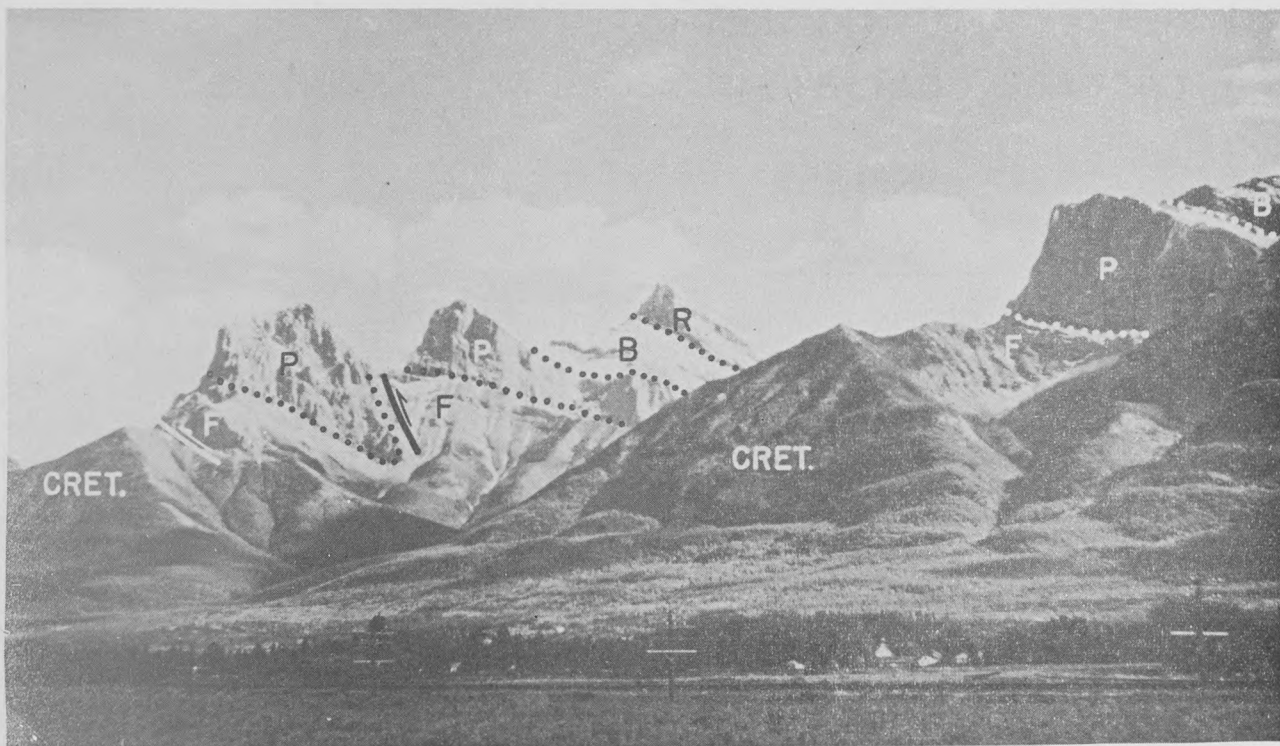


PLATE II - Three Sisters Mountain,
Canmore Alta.

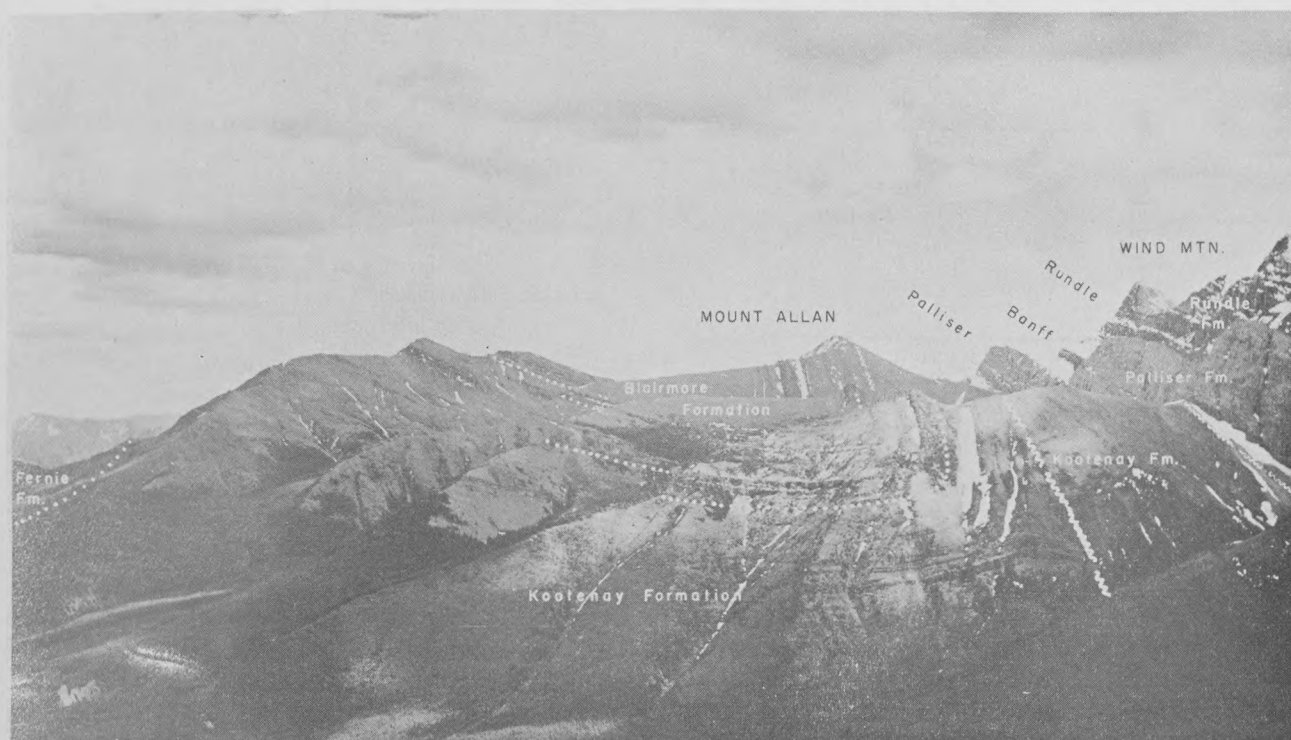


PLATE III - View of Cretaceous Syncline from
Wind Ridge, Canmore Alta.

FIELD TRIP NO. 2

Mileage

- 0.0 Busses will load in the Courtyard of the Banff Springs Hotel and proceed northwestward towards the town of Banff. Note:- The route of Field Trip #2 follows the Banff-Calgary Highway. Stops are indicated on the colored geological map. The structure cross-sections prepared by L. M. Clarke will also aid greatly in understanding the structure of the mountains seen in today's field trip.
- 0.3 Junction -- proceed straight ahead. Road to right is the drive to the Dominion Government Fish Hatchery, Bow Falls and Banff Springs Golf Course.
- 0.7 Hospital on the right and Parks Administration Building on the left.
- 0.8 Stop-sign at south end of bridge across Bow River. Busses will turn right (north) and proceed across bridge and along Banff Avenue to the Calgary-Banff Highway.
- 3.0 Junction -- continue straight ahead. Road on left to animal paddocks. Buffalo, Mountain Goat, Moose, etc. in enclosures.
- 3.2 Junction -- proceed straight ahead. Road on left is Lake Minnewanka Road, part of the route covered on Field Trip, No. 1.
- 3.4 Sand Dunes exposed in road cut. These dunes are located along the western end of the glacial lake, the old lake bed of which we have just traversed.
- 3.9 Top of "Anthracite Hill." The surface trace of the Rundle-Cascade Mountain thrust fault occurs approximately at this point. The fault zone (Devonian thrust over Lower Cretaceous) is exposed in a railway cut on the valley floor about 400 yards to the north. The highway now continues south-eastward along the Cascade coal basin for approximately 15 miles before cutting through the Paleozoics of the next thrust block to the east.

- 4.9 Exposures on right bank of river valley are unsorted glacial till resting on sorted gravels.
- 5.1 Hydro-electric Plant on left of highway.
- 5.3 Railroad crossing. Main line of the Canadian Pacific Railway.
- 5.4 Junction -- proceed straight ahead. Road to left is route used on return trip from Lake Minnewanka on Field Trip No. 1. Slack heaps on left from the old Anthracite Coal Mine, now abandoned. Note:- the coal mined here was high-grade bituminous.
- 5.9 "Hoodoos" to the left of the highway are formed by differential erosion of glacial till
- 6.6 An old Indian grave is visible on the point of the gravel bank to left of the highway.
- 7.6 Exposures of river gravels.
- 10.0 Bridge across Carrot Creek -- Mountain to right is Mr Rundle.
- 11.5 East entrance to Banff National Park. The buildings are constructed from Cretaceous sandstone quarried near Anthracite.
- 12.7 Gateway Inn.
- 15.7 Side road to town of Canmore (population approximately 1200). Canmore is a coal mining town. The coal seams are Lower Cretaceous in age.
- 16.4 Excellent view of Three Sisters Mtn. ahead and to the right.
- 16.8 Purple and green shales of the Upper Rundle (Miss.) are exposed on the upper slopes of Grotto Mtn. ahead and to the left.

19.0 STOP #1 (15 minutes)

Busses will turn off highway to right on gravel road. A few comments will be given at this stop by Mr. M. B. Crockford, Chief Geologist for the Alberta Government Conservation Board, dealing especially with the Mesozoic sediments exposed below the Three Sisters - Rundle Mtn. thrust (Plate #14)

19.2 Junction of gravel road with Banff Highway. Busses will continue on eastward.

20.5 Gap. Station on C.P.R. At approximately this point highway cuts into the Paleozoics that form the east side of the Cascade Coal Basin.

21.1 Exposures of Rundle formation (Miss.) along the road cut.

21.2 Exposures of Banff formation (Miss.) in road cuts.

21.5 STOP #2 (20 minutes)

Busses will pull off the highway at the top of the hill and park on the grassy slope to the right. Mr. Les Clark, Chief Geologist for Seaboard Oil Company in Calgary, will discuss the stratigraphy and structure of the ranges to the east.

21.7 Outcrop of Banff formation (Miss.). The beds along the highway belong to the Middle Banff limestone member.

22.2 Rock Wool Plant -- Quarry is in lower Banff shale exposed above the plant.

23.7 From this point on the highway the trace of the Lac des Arc fault can be seen ahead near the top of the mountain on the left. The fault is a high angle reverse type with trace running up the sharp gully to crest of the ridge. Lowest part of the Rundle formation lies east of the fault but is cut off before reaching

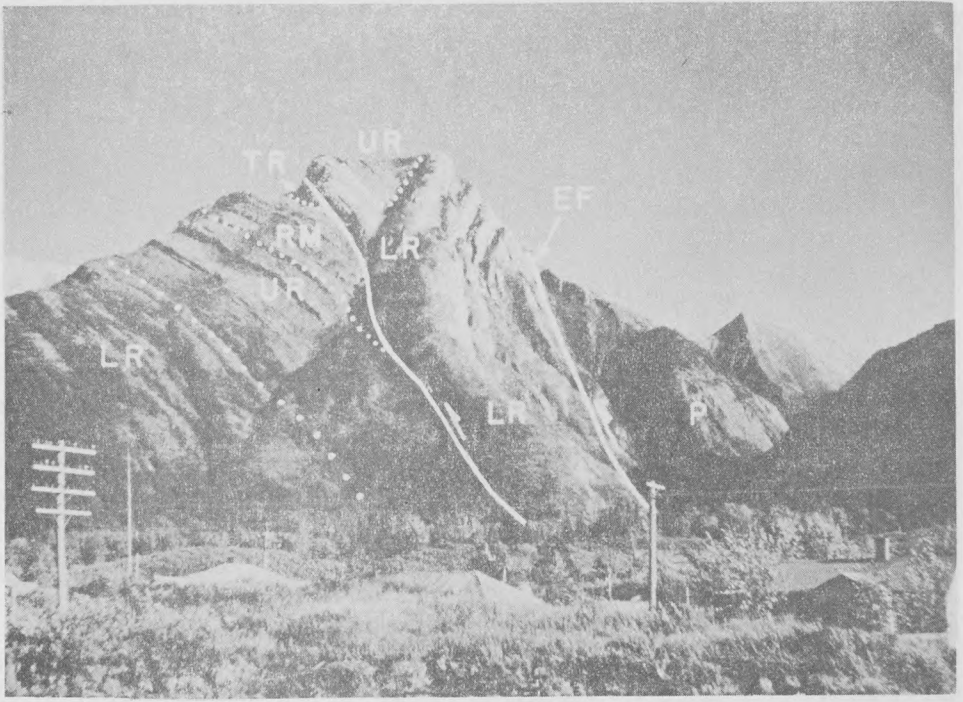


PLATE IV - Heart Mountain, Exshaw Alta.

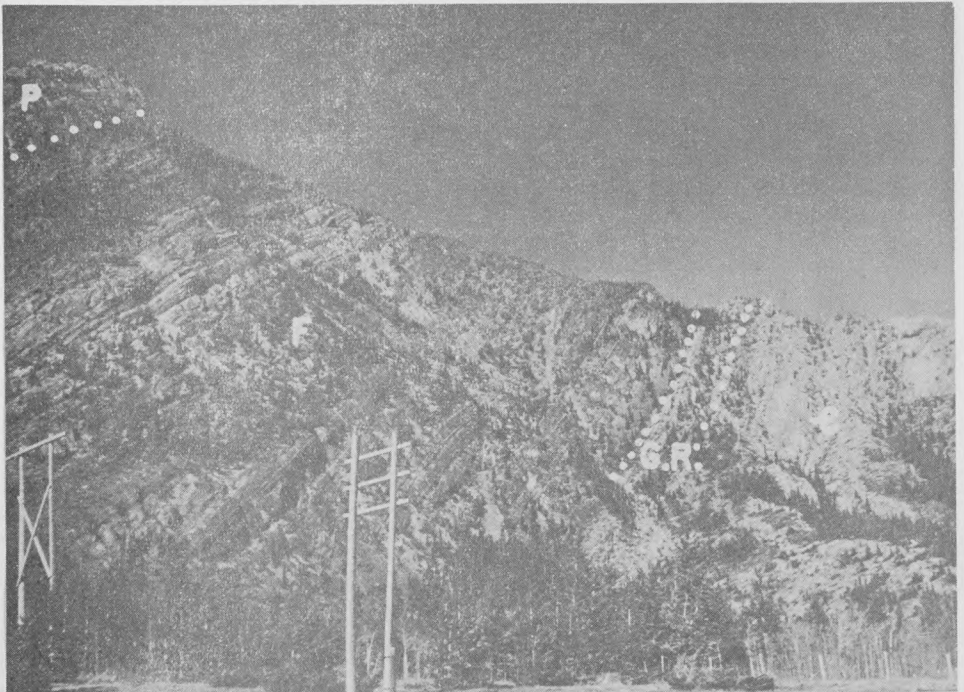


PLATE V - Devonian & Cambrian Section
at Loder's Lime Kiln,
Kananaskis Alta.

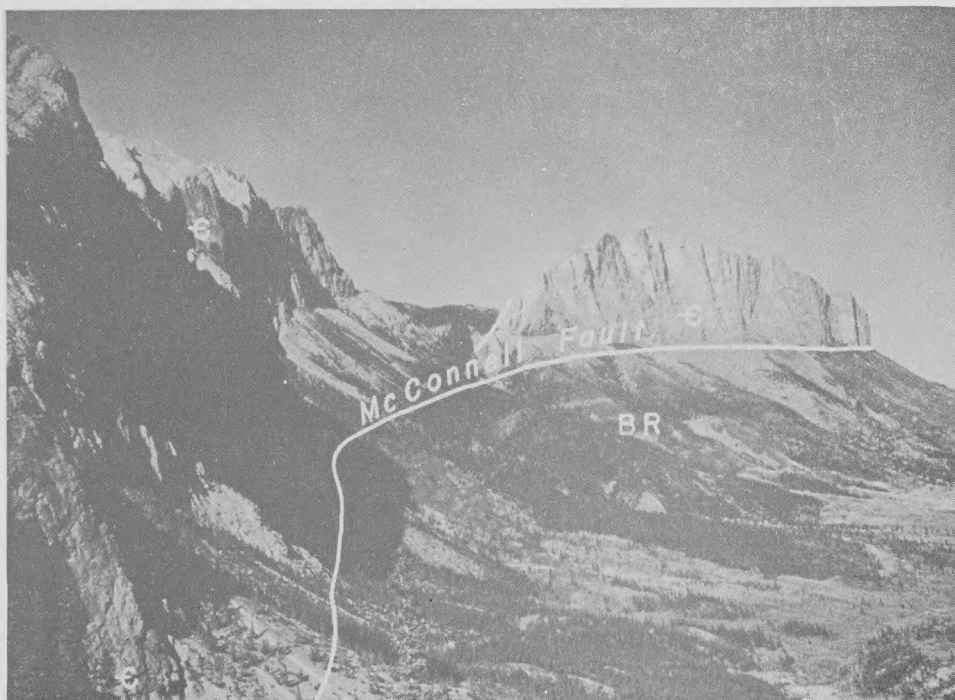


PLATE VI - Yamnuska Mountain, Seebe Alta.



PLATE VII - End Mountain Syncline,
Bowfort Alta.

the highway. The darker limestone west of the fault is Cambrian overlain by Ghost River formation and that, in turn, by Fairholme dolomite (very dark colored). The fault dips westward at a few degrees less than the dip of the strata.

- 23.9 Outcrop of Fairholme formation (Devonian) along highway. Coralline, bryozoan and stromatoporoid fossils.
- 24.3 Crossing Lac des Arc fault. Beds above fault plane are Cambrian thrust over shales and limestones of the Banff formation (Miss.).
- 24.4 Exposures of Banff formation along the highway for the next 500 yards.
- 24.8 Exposures of black calcareous shale on left of highway. Note:--this shale occurs in the Banff formation and is often mistaken for the Exshaw shale, the formation which marks the top of the Devonian section. The true Exshaw formation is not exposed along the highway but occurs stratigraphically in the grassy gully just below the 35-foot massive brownish weathering argillaceous limestone which underlies the Black Shale exposure.
- 24.9 Exposures of Palliser formation (Devonian) along highway for next $\frac{1}{2}$ mile. The quarry which is visible above the highway on the mountain side is used for the manufacture of cement.
- 25.6 Exshaw Cement Plant to left of highway.
- 25.9 STOP #3 (15 minutes)

Busses will pull off on the left hand side of the road at the service station at Exshaw. Mr. Les Clark will discuss the geology of the surrounding mountains. Note:--The surface trace of the Exshaw fault which forms the Valley to the left (north) approximately passes through this point. The main fault lies a little west of the summit of Heart Mountain and an eastern branch lies east of the summit. (Plate #5). This branch rejoins the main fault 3 miles to the southeast. To the east

of this faulting there is a complete section from the Triassic through the Pennsylvanian, Mississippian, Devonian, Ghost River and approximately 1500' of the Middle Cambrian. This is the most easterly fault block of the mountains and contains one of the longest simple sections.

27.1 Jura Creek Valley to the left. The type section of the Exshaw formation (Devonian) occurs $1\frac{1}{2}$ miles up this creek. The valley itself is not a fault valley but is carved out of the Banff and Exshaw formations.

27.3 Outcrop of Palliser formation (Devonian) along highway to left.

27.7 STOP #4 (15 minutes)

A stop will be made at this point on the highway to view an excellent succession of beds on the mountain on the left side of the highway. (Plate #6). At this locality most of the Palliser formation, all of the Fairholme and Ghost River formation and the upper part of the Cambrian section is well exposed. A few comments will be given by Mr. Les Clark.

28.2 Loder Lime Plant. Quarry is in bed of very pure, white limestone in the Cambrian.

30.1 STOP #5 (10 minutes)

A short stop to view Mt. Yamuska (Plate #7). The fault plane between the overlying Cambrian limestone and the underlying upper Cretaceous shales and sandstones is well exposed at the base of the sheer cliff. Mr. Les Clark will discuss the stratigraphy and structure.

30.5 Junction -- Busses will turn off the Banff-Calgary highway at the gravel road to the right which leads to the Kananaskis Dam.

31.7 Kananaskis Dam.

Stop for lunch.

The dam is constructed on Cardium Sandstone beds (Upper Cretaceous) which are well exposed below the dam. The dark grey fissile shales belong to the Alberta formation (Colorado). After lunch Dr. H. H. Beach, Chief Geologist for McColl Frontenac Oil Company, will discuss the geology of the general area. The trip has traversed the mountain ranges eastward from Banff and is now in the Foothills Belt, a highly faulted zone of mesozoic sediments which extends approximately 25 miles eastward before the flat lying beds of the plains are reached.

After lunch the busses will retrace the route and stops will be made where permissible along the highway to enable members of the field trip to take additional pictures.

ERRATA

On Geological Map, Colored, COCHRANE Area, Alberta:

In the Legend, the age of the Blairmore should be shown as LOWER CRETACEOUS and the Kootenay as LOWER CRETACEOUS-JURASSIC?.

On Geological Map, Colored, BANFF Area, Alberta:

A linear area extending north and south of Lac des Arcs on the west side of the town of Exshaw is shown as outcrop of Banff formation. Except in the Bow Valley a wedge of Rundle formation should be shown overlying the Banff.

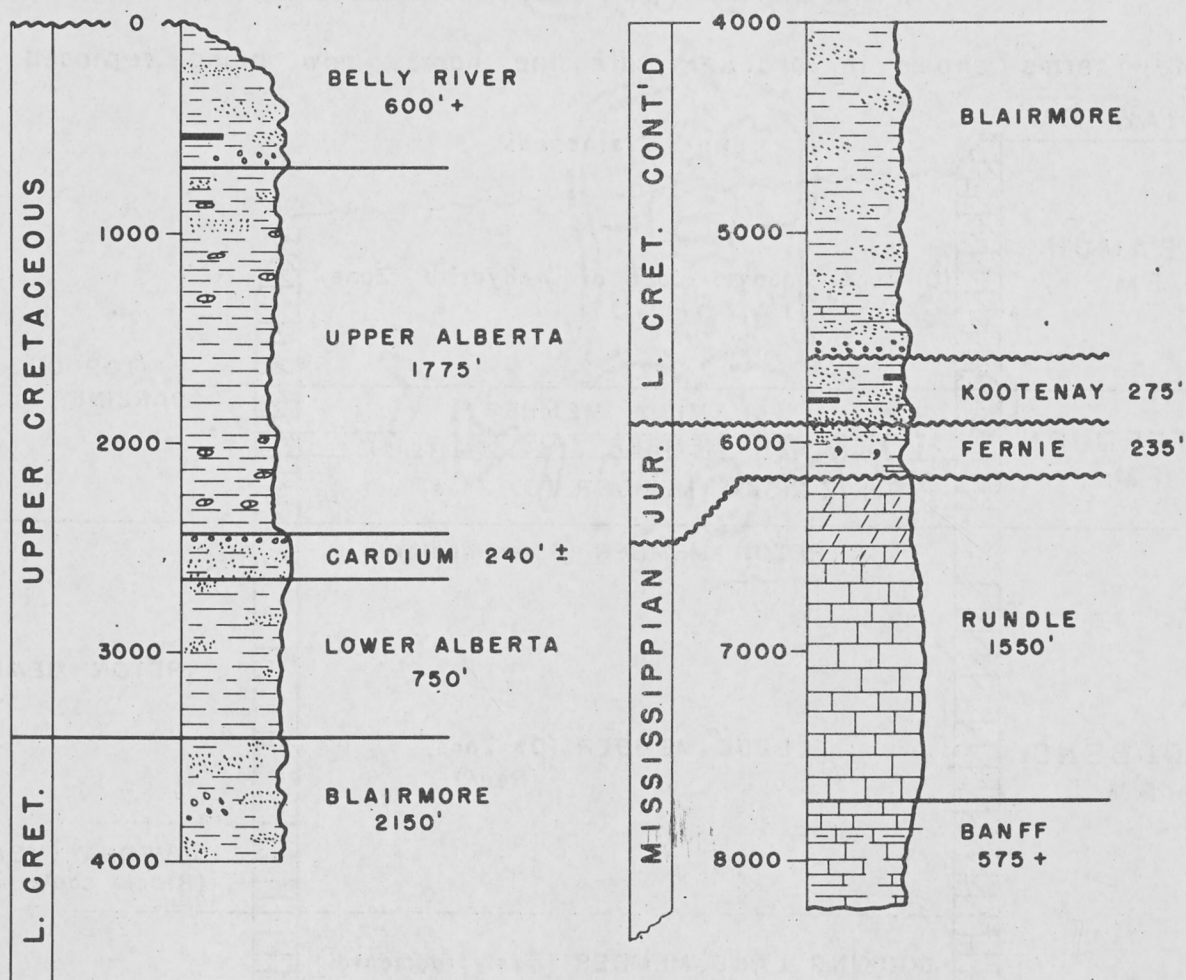
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Meeting 1950, Banff, by:

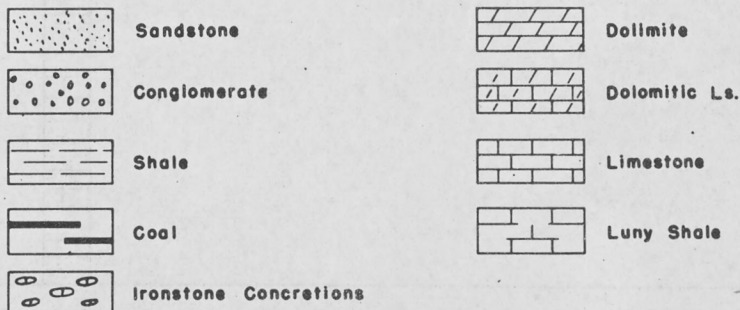
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STRATIGRAPHIC COLUMN FOOTHILLS AREA ADJACENT TO CALGARY - BANFF HIGHWAY



LEGEND



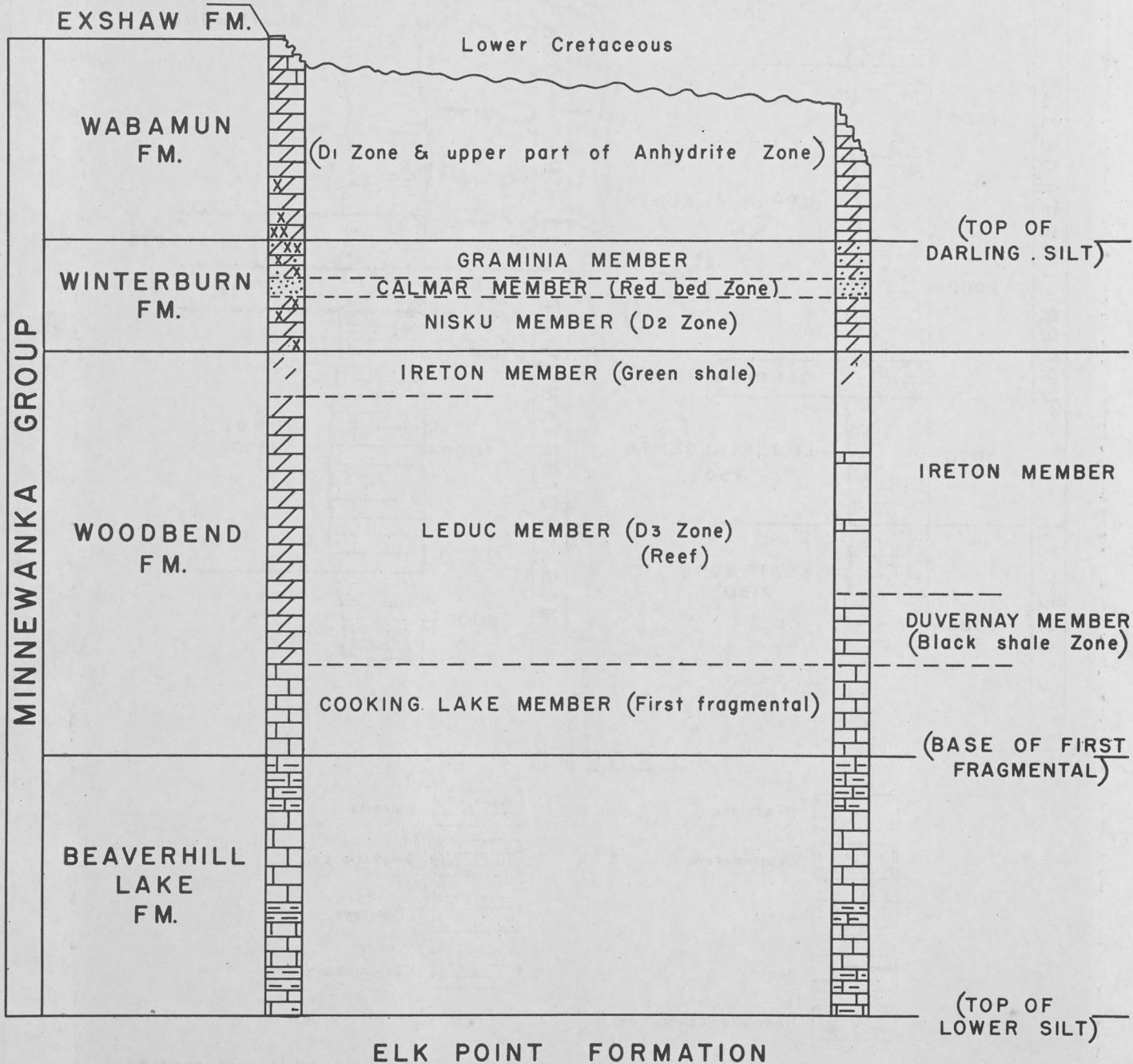
Note - Early Palaeozoic not exposed in this area of the foothills

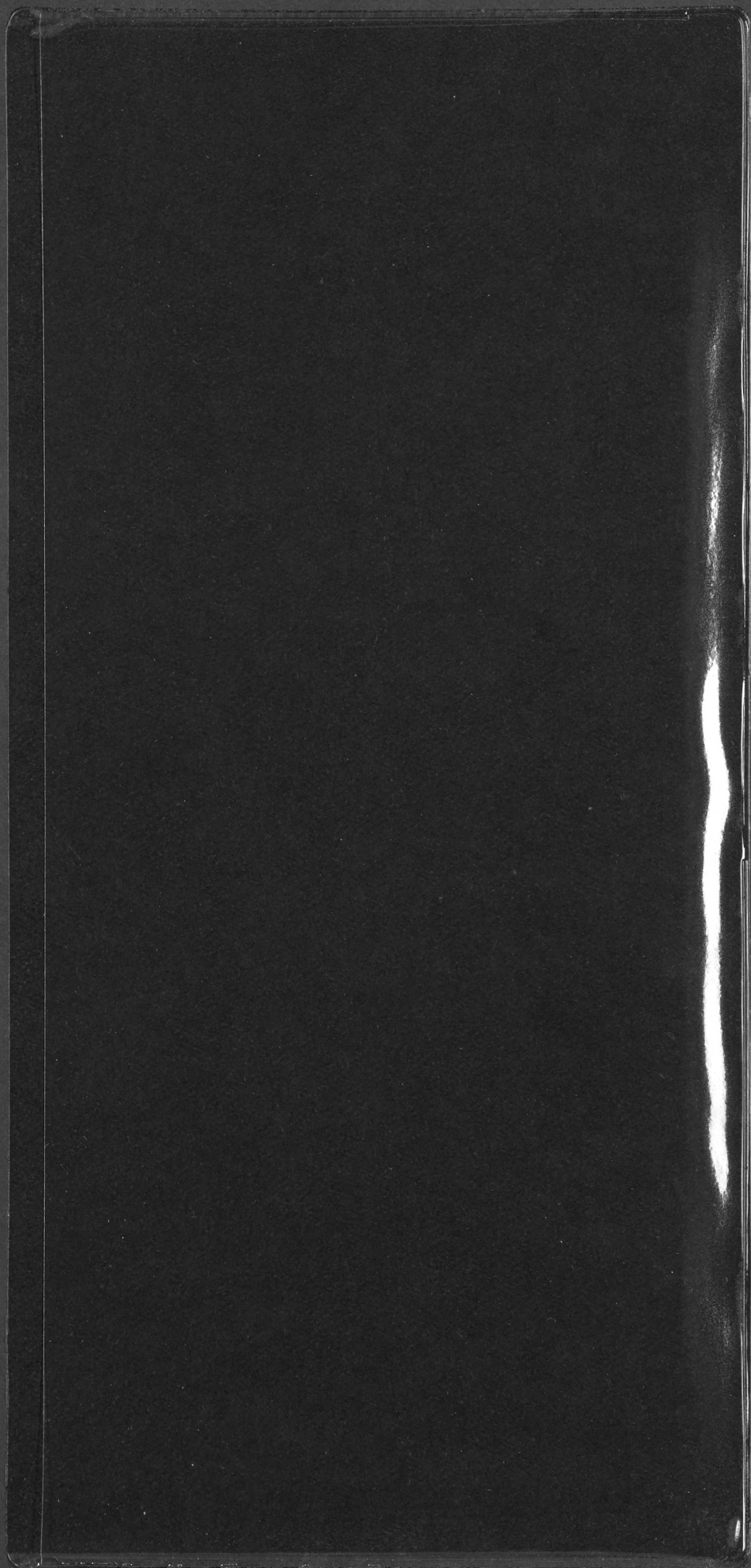
FIG. 4

GENERALIZED CHART SHOWING THE DEVONIAN TERMINOLOGY IN THE EDMONTON AREA

VERT. SCALE (APPROX.) 0'500'

Note—terms shown in brackets are the names now being replaced

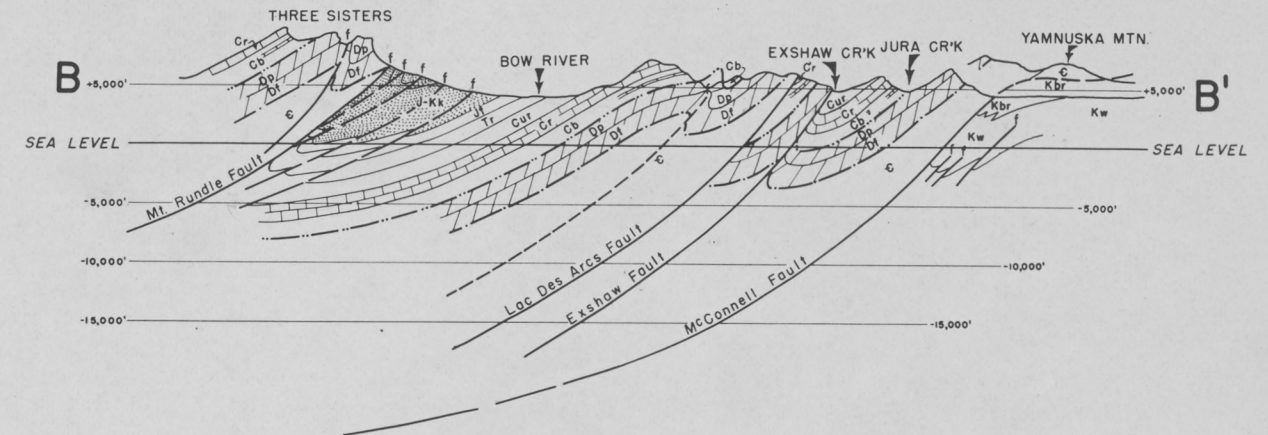
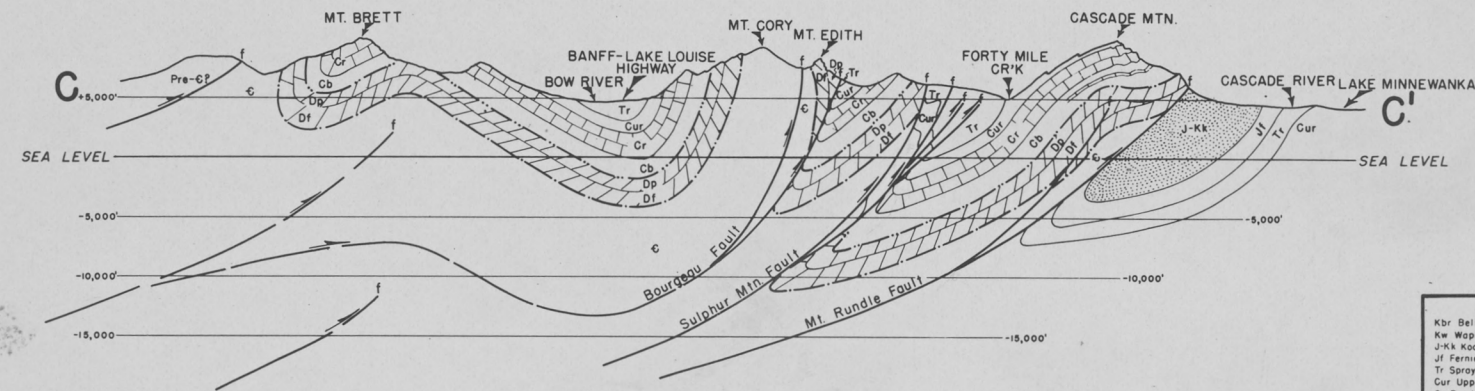




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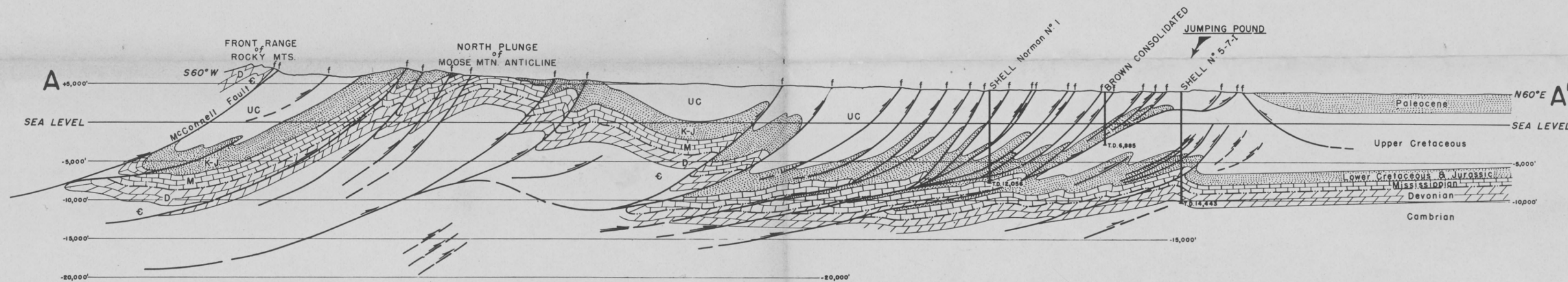
CROSS SECTION ACROSS THE FOOTHILL BELT & EASTERN RANGES OF THE ROCKY MTS.

by
L. M. CLARK



Legend for B-B' & C-C'

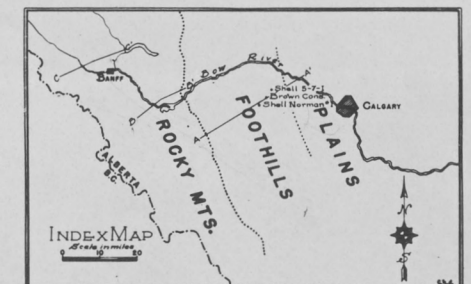
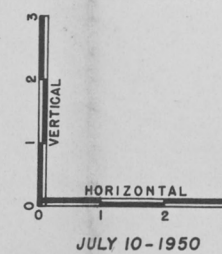
- Kbr. Belly River } Upper Cretaceous
- Kw. Wapiti } Upper Cretaceous
- J-Kk Kootenay-Jurassic-Lower Cretaceous
- Jf. Fernie-Jurassic
- Tr. Spray River-Triassic
- Cur. Upper Rundle & Rocky Mtn.-Upper Mississippian, Pennsylvanian & Permian
- Cr. Rundle } Middle & Lower Mississippian
- Cb. Banff } Middle & Lower Mississippian
- Df. Fairholme } Upper Devonian
- Exshaw } Upper Devonian
- Ghost River } Middle Devonian
- C. Cambrian Undifferentiated
- Pre-C. Pre Cambrian



Legend for A-A'

- P. Postpaleo - Paleocene
- UC - Edmonton, Belly River & Colorado Shale - Upper Cretaceous
- K-J - Blairmore, Kootenay & Fernie - Lower Cretaceous & Jurassic
- M - Rundle & Banff - Mississippian
- Exshaw - Upper Devonian
- D - Upper Devonian, Undifferentiated
- C - Cambrian

Scale in miles



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Map compiled by D.B. Layer and S.R.L. Harding;
Imperial Oil Limited, and L.M. Clark, Seaboard
Oil Company of Delaware.

A.A.P.G. Regional Meeting—Banff, Alberta.
Sept. 5-8, 1950.

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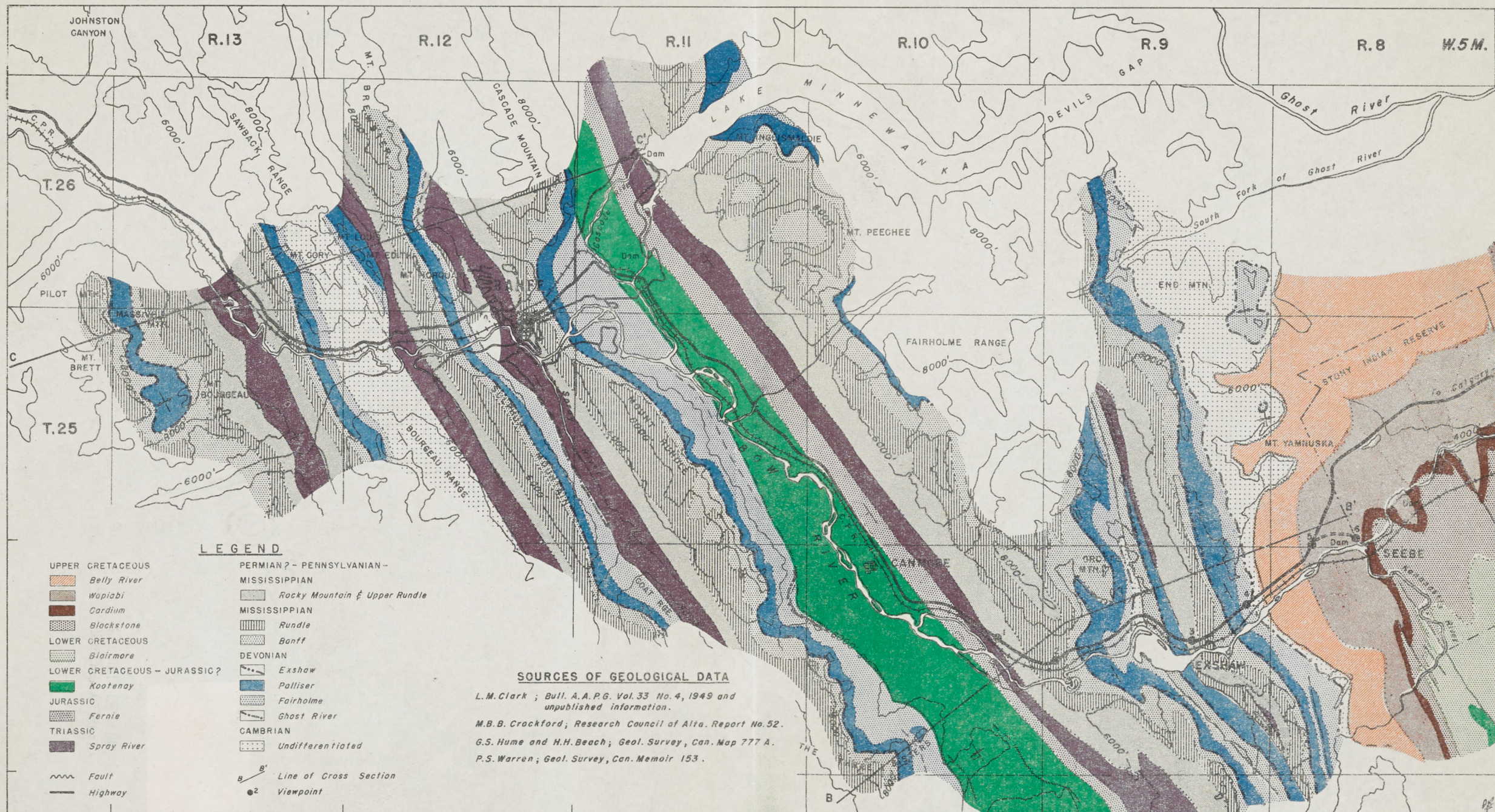
GEOLOGY ADJACENT TO HIGHWAY No. 2 BETWEEN SEEBE & JOHNSTON CANYON

Scale, 1 inch to 3 Miles

0 1 2 3 4 5 MI.

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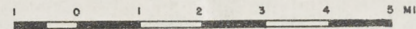
Map compiled by D.B. Layer and S.R.L. Harding;
Imperial Oil Limited, and L.M. Clark, Seaboard
Oil Company of Delaware.

A.A.P.G. Regional Meeting - Banff, Alberta.
Sept. 5-8, 1950.

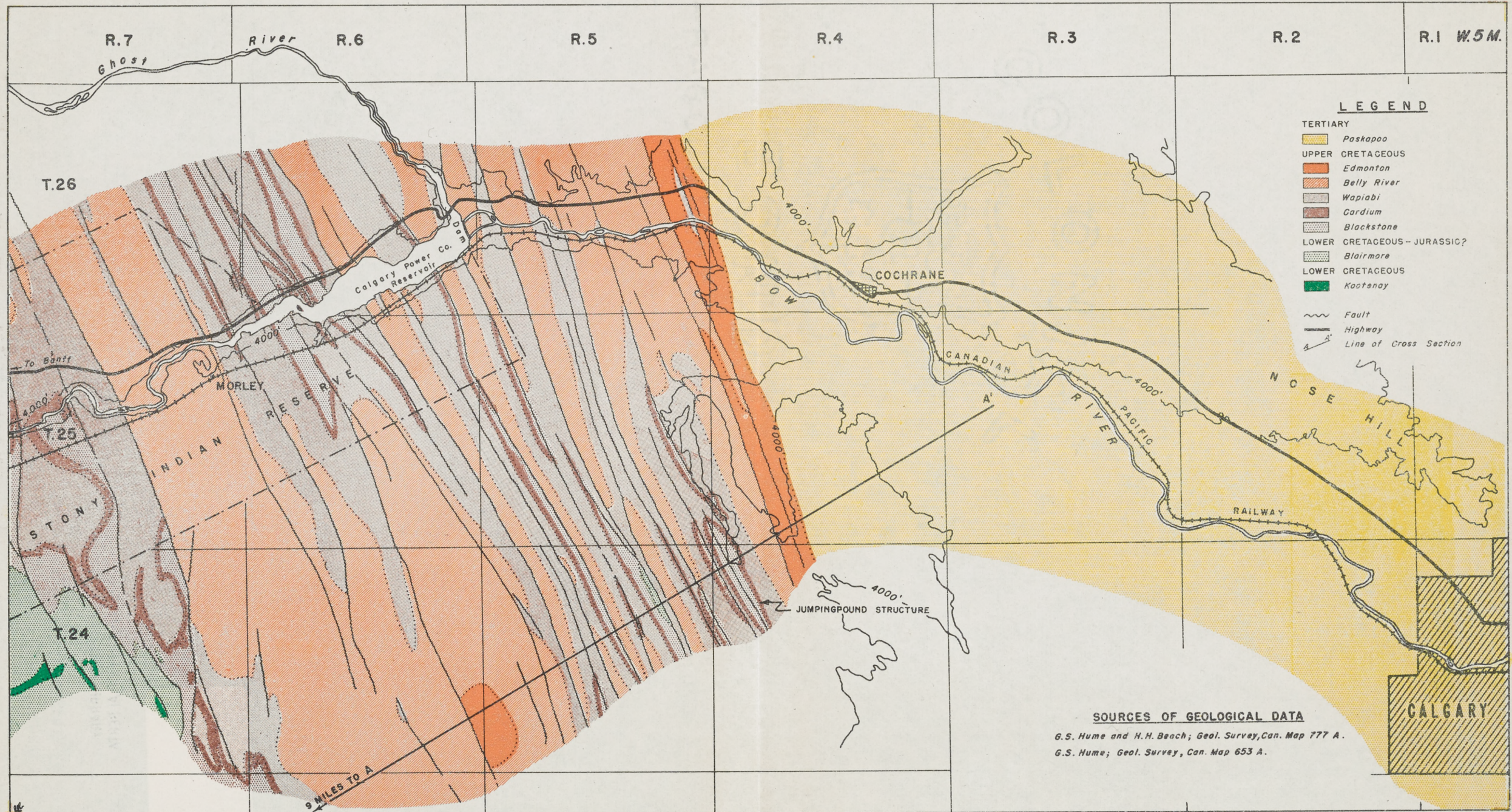
COCHRANE AREA, ALBERTA

GEOLOGY ADJACENT TO HIGHWAY No. 2 BETWEEN CALGARY & MORLEY

Scale, 1 inch to 3 Miles



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LEGEND

- TERTIARY**
- Paskapoo
- UPPER CRETACEOUS**
- Edmonton
 - Belly River
- Wapiabi**
- Cardium
- Blackstone**
- LOWER CRETACEOUS - JURASSIC?**
- Blairmore
- LOWER CRETACEOUS**
- Kootenay
- Other Symbols:**
- Fault
 - Highway
 - Line of Cross Section

SOURCES OF GEOLOGICAL DATA

G.S. Hume and H.H. Beach; Geol. Survey, Can. Map 777 A.
G.S. Hume; Geol. Survey, Can. Map 653 A.

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STRATIGRAPHIC CORRELATION CHART
WESTERN CANADA & ADJOINING AREAS

		North Dakota	Montana	South Saskatchewan	South Alberta	Montana	Wyoming	Central Alberta	South Alberta	North Alberta	Pouce Coupe	Lower Peace River	Athabasca McMurray	Slave River	N. W. T.
CENOZOIC	PLIOCENE														
	MIOCENE			Wood Mountain											
	OLIGOCENE	White River Group		Cypress Hills									Swon Hills		
	Eocene	Wasatch		Swift Current											
	PALEOCENE	Fort Union	Turtle Mountain	Ravensthorpe		Fort Union	Fort Union	Parkston	Porcupine Hills	Paleocene					
CRETACEOUS	UPPER	Montana													
		Pierre	Riding Mountain	Marine Shale											
		Pembina		Belly River											
	UPPER	First Yellowknife Specks													
		Second White Specks													
		Colorado													
	LOWER	Dakota													
		Fuson													
		Minewassee													
		Lakota	Swon River group	Blairmore	Blairmore	Kootenai		Blairmore (McMurray)	Blairmore	Luscar	Gething	McMurray			Slave Sulphur group
MESOZOIC	UPPER														
		Morrison	Morrison ?	Morrison ?											
		Sundance	Sundance ?	Sundance											
	MIDDLE														
	LOWER														
PALEOZOIC	TRIASSIC														
	PERMIAN														
	PENNSYLVANIAN														
	MISSISSIPPIAN														
PALEOZOIC	DEV. or MISS.														
	DEVONIAN														
	SILURIAN														
	ORDOVICIAN														
PALEOZOIC	CAMBRIAN														
	SILURIAN														
	ORDOVICIAN														
	CAMBRIAN														

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